



IBS Center for Molecular Spectroscopy and Dynamics

COLLOQUIUM

■ **SPEAKER**

Prof. Harold Kim (School of Physics, Georgia Institute of Technology)

■ **TITLE**

Single-molecule studies of DNA looping and strand displacement

■ **ABSTRACT**

DNA in its most stable form can be depicted as a twisted ladder with base-pair steps stacked in parallel, but due to thermal energy, base-pair steps can tilt, and base pairs can separate. These spontaneous bending and breathing fluctuations can cause dramatic changes in DNA configuration and base accessibility, and therefore are closely coupled with packaging and processing of the genome inside the cell. To shed light on the energetics and kinetics of these motions, our group has been studying DNA loop formation and DNA strand displacement using single-molecule fluorescence. In the first half of my talk, I will present our in-depth study on the stability of small DNA loops formed by cyclization (end-to-end annealing) of short DNA molecules. By measuring the loop lifetime as a function of loop size, we are able to study the elastic properties of DNA in different physical regimes. Our results are consistent with modeling DNA as a self-avoiding wormlike chain with stackable ends. In the second half, I will talk about the kinetics of DNA strand displacement where a single-stranded DNA can invade a double-stranded DNA by way of spontaneous base-pair opening and closing. Our unique experimental strategy allows us to directly measure the first passage times of this multi-step stochastic process. We find that the mean first passage time depends not only on the base-pair sequence, but also on the sequence of dangling bases. I will propose a simple quantitative model that correctly predicts the observed sequence dependence of strand displacement kinetics.

■ **DATE AND VENUE**

June 21, 2018 (Thursday, 5:00 - 6:00 pm)
Seminar Room 116, KU R&D Center

■ **LANGUAGE**

English

■ **INVITED BY**

Prof. Hong, Seok-Cheol

*If you want to have dinner with Prof. Harold Kim or discuss with him, please contact Prof. Hong, Seok-Cheol(hongsc@korea.ac.kr)